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Field Independent Girls and Their Ability to Solve Problems While Distracted

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FIELD INDEPENDENT GIRLS AND THEIR ABILITY TO SOLVE
PROBLEMS WHILE DISTRACTED

by

Paul J. Wolf

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Life

Paul J. Wolf was born in Quincy, Illinois on March 24, 1935. He was graduated from St. John's University, Collegeville, Minnesota, with a Bachelor of Arts degree in Philosophy and Mathematics in June of 1959. He spent two years in the United States Army and one year working as a Social Worker at Lincoln State School for the Retarded. He came to Loyola University, Chicago in 1963 to do graduate work in clinical psychology.

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Abstract

Two hundred and sixty-six 7th grade and 8th grade students were tested on a perceptual discrimination task (Hidden Figures Test) and a measure of drive (The Children's Manifest Anxiety Scale). Otis IQ scores were also available. The HFT was found to be significantly positively correlated with the Otis for both boys and girls. The CMAS was found to be negatively correlated with the Otis for girls, but not for boys. The HFT was found to be significantly negatively correlated with the CMAS for girls, but not for boys. Boys were found to be significantly better on the HFT than girls. Boys were also found to answer significantly fewer questions on the CMAS as true.

Of the total group of subjects tested, 85 girls who scored between 90 and 115 on the Otis were tested on three of Rimoldi's problems under stress or nonstress conditions. An hypothesis was made that girls who scored higher on the HFT would do better on the problems than girls who scored lower both under stress and nonstress conditions. An hypothesis also was made that girls who scored lower on the CMAS would do better at problem solving both under stress and nonstress conditions. Neither of these hypotheses were supported by the results. A discussion of the results is presented.

CHAPTER I

Introduction

Prior to 1954 and Witkin's research, there were two basic approaches to the study of perception. One viewed perceptual experience in terms of the structure of the field. The other approach emphasized the nature of the stimulus giving rise to perceptual experience and the specific operations and natural structures of the sense organs. Discrepancies between the stimulus and the person's perception were credited in terms of the person's past experience with the specific stimulus and not attributed to a general life experience (Witkin, Lewis, Hertzman, Machover, Meissner & Wapner, 1954).

Witkin's approach to finding a comprehensive estimate of the role of personal factors in perception is to explore the role of field factors in the situations used, as well as to employ stimulus conditions which are neither vague and impoverished nor completely determined. In these situations, the person has the opportunity to provide his own structure.

His early research with this approach indicated that people varied widely in their manner of perception as he demonstrated in a series of orientation tasks. He concluded that the subjects differed essentially in the relative extent to which they depended on the visual field or in their ability to use bodily experiences in overcoming the influence of the field (Witkin et al., 1954). As he began to study this phenomenon more extensively, 3 tests of space orientation were developed; the Rod-and-Frame Test (RFT), the

Tilting-Room-Tilting-Chair Test, and the Rotating-Room Test. In each of these the subject may locate the upright according to the axis of the visual field or with reference to sensations from his own body. He is required to indicate this location by adjusting an item (his body, the field, or a rod) to a position which he perceives as vertical. Additional perceptual tests which did not involve the general process of orientation toward the upright were used. Among these is the embedded-figures test (EFT), a pencil and paper test in which the subject is required to locate a simple "hidden" figure within a larger complex figure. (It is this test which has been used most widely by experimenters because it is easily administered, and has been adapted to group administration.) Other tests used by Witkin and his associates included auditory, body-steadiness, body balance, and two-hand coordination tests. In all of these, the principle differentiation is whether the subject uses the field or his own internal perception in his performance.

In addition to the perceptual tasks Witkin and his associates also administered a battery of personality tests to each subject. These included an autobiography, personality questionnaires, a sentence-completion test, a clinical interview, a figure-drawing test, the Rorschach test, the Thematic Apperception test (TAT), and a word-association test.

On the basis of the results of this experimentation the continuum of field-dependence/field-independence was defined and the characteristics of people at the two extremes of the continuum were described. The field dependent individual is defined as one who, in perceptual situations, finds it difficult to overcome the influence of the surrounding field or to separate an item from its context. On the other hand, the field independent person can

distinguish an item from its context; he is more likely to attempt to structure ambiguous stimuli than the field dependent individual, who experiences them as vague and indefinite. The characteristics which were distinguished, each referring to a specific segment of behavior, fall into several definite clusters: the quality of the experience of one's surroundings, the way of perceiving and using the body, the nature of relations to others, and aspects of controls and defenses. The patterns observed suggest consistency in psychological functioning which pervades the individual's perceptual, intellectual, emotional, motivational, defensive, and social operations. The continuity over time of these patterns suggest that they become a style of life (Witkin, Dyk, Fatterson, Goodenough, & Karp, 1962).

In the future development and expansion of this basic work, Witkin has related field dependence-independence to the global-articulated cognitive style, which in turn is the cognitive component of psychological differentiation (Witkin, et al., 1962; Witkin, 1965). Differentiation refers to the complexity of structure of a psychological system. One of the main characteristics of greater differentiation is specialization of function; another is clear separation of self from nonself. At any level of differentiation varied modes of integration are possible, although more complex integrations may be expected with more developed differentiation. Adjustment is mainly a function of effectiveness of integration and may be found at any level of differentiation (Witkin, 1965). Therefore, the person who is field dependent experiences the environment in a global, diffused way. He is relatively undifferentiated in his psychological structures. The field independent person is more complex and differentiated. His increased articulation implies delineated and

structured experience and an ability to analyze and structure his experience of the environment in an active way.

One variable that seems to be most sharply defined from these experiments is the sex variable. Witkin et al. (1962) found that males tended to be analytical and females tended to be global in their cognitive styles. They also found that this was consistent in both children and adults on all their perceptual measures. Thornton and Barrett (1967) noted that the Embedded Figures Test (EFT) may not be appropriate for females as a measure of field dependence, but rather may be a measure of achievement motivation for them. The exact relationship of sex to these perceptual tasks does not seem clear at this point in the research.

One of the questions that can be asked about field dependence is its relationship to learning. Does a person learn to be field dependent or is he born that way? Although this question is not likely to be answered easily, it would appear to have definite implications for hypotheses built around the results of Witkin and his followers. For example, could a person who is basically field dependent learn to become analytical if he were sufficiently motivated? If he learned a dependent approach initially, it would seem possible that in certain circumstances, he could learn to be analytical. If this is true, then a person could be field dependent at one time in his life and field independent at another. Or it may be possible that a person could approach some problems in a global way and some in an analytical way. There is some support for the former statement from research of the aged done by Schwartz and Karp (1967) and Karp (1967). Both of these studies indicated that people tended to become more field dependent with age and that the

distinction between the male and female tended to lessen so that in old age there is no difference between the sexes.

The reason females may be less analytically oriented than males has been connected with social learning. In an experiment by Iscoe and Carden (1961) it was found that field independent girls were not as well accepted by their classmates as were the dependent girls. It was also found that field independent girls tended to score higher on the Children's Manifest Anxiety Scale (CMAS) than dependent girls. This latter finding is in direct conflict with Witkin's description of field independent people whom he describes as tending to show less manifest anxiety (Witkin, 1962).

This experiment was planned to have two essential parts. The first part was a study of the relationships between a perceptual discrimination task, in this case a group form of the Embedded Figures Test known as the Hidden Figures Test (HFT), and an anxiety scale and intelligence. The purpose of this portion of the experiment was to further investigate findings reported in the literature. From the literature, the following hypothesis about the relationships among variables were made:

- 1) Males tend to be more field independent than females as measured by the Hidden Figures Test (HFT).
- 2) Females tend to be more anxious than males as measured by the Children's Manifest Anxiety Scale (CMAS).
- 3) Field dependency is directly related to anxiety; i.e., the HFT is negatively correlated to the CMAS.
- 4) Field dependency is not correlated with verbal intelligence, i.e., the HFT is not correlated with the Otis, Form B.

5) Anxiety is inversely related to intelligence; i.e., CMAS scores will be negatively correlated with Otis scores.

The second part of this experiment examined the relationship of field dependency, and problem solving in girls. Grade school girls were used as subjects because it was felt that they would be less influenced by the cumulation of social learning than adults. Also girls were used as subjects because it was felt that any ability at problem solving that they might have is contrary to female social pressures; and because using only a single sex control for the sex variable. In order to present a situation in which the field independent female might best show her field independent superiority to her field dependent sister, a situation of distractability was introduced.

For this part of the experiment the literature suggests the following hypotheses:

6) Field independent girls are better problem solvers, i.e., those who score higher on the HFT will tend more to follow a logical process to a conclusion on Rimoldi's problems

7) Field independent girls are not as affected by distraction as field dependent girls on problem solving tasks, i.e., girls who score higher on the HFT do better on Rimoldi's problems under the stress condition.

8) High anxious subjects are poorer problem solvers, i.e., high CMAS subjects score significantly lower on Rimoldi's problems than low CMAS subjects.

9) High anxious subjects are more affected by stress than low anxious subjects, i.e., high scores in the CMAS do worse under stress than low scorers on the CMAS.

CHAPTER II

Related Literature

Field Dependence

Holtzman (1955) was the first to criticize Witkin's statements in his interpretation of much of the personality data from the Rorschach which Holtzman believed had not been demonstrated experimentally. Holtzman also commented that the Rorschach is, in itself, a perceptual test and, therefore, somewhat similar to the variables being used in the differentiation tasks. As a result of his criticism it became desirable that replication of Witkin's results be attempted.

Young (1959) replicated Witkin's study using the Rod-and-Frame Test, the Embedded-Figures Test, and the Chair-Window Test. His personality measures included Machover's Draw-a-Person Test (DAP), Holtzman's Inkblot Test, and Worchel's Self-Activity Inventory. The results basically supported Witkin's assertions. However, in a number of areas women differed from men, a result which Witkin also had found. Correlations were consistently higher for men than for women between measures of self attitudes of passivity, dependency, distrust of one's own feelings and measures of bodily experiences related to field dependency on the perceptual tasks. More correlations between responses on the inkblots suggesting a lack of effectiveness in coping with the environment and field dependency were found for women than for men. No

significant correlation was found for women between responses to inkblots implying a lack of introspectiveness and field dependency whereas two of five correlations were significant for males.

Due to the fact that Young's results were not as clearcut as Witkin's, he concluded that the dimension of field independence was not as factorially pure as Witkin had suggested.

It is generally stated in the literature that sex related traits are correlated with field independence. The following studies deal directly with this problem. Vaught (1967) divided 42 females into field dependent and field independent groups. He used form discrimination tasks involving sight and touch. Contrary to what was expected, his field dependent females were better discriminators with touch than the field independent ones. Barclay (1967) found that males whose fathers were absent from the home tended to be more field dependent and Bieri (1960) found that both male and female subjects who identified more with the father tended to do better on the EFT. He also discovered that an authority acceptance scale may be even a better predictor of EFT scores than father identification scales.

Willoughby (1967) found a significant correlation between a scale designed to estimate the amount which a person relies on others for an evaluation of himself and the Hidden Figures Test (HFT), the group form of the EFT. He found no difference between males and females on the HFT. There was no significant correlation between the HFT and a scale designed to measure the control a person felt he had over the environment. McDonald and Hendry (1966) scored college males, college females and unwed pregnant females on the Repression-Sensitization scale (R-S), the F-scale of the MMPI and the EFT.

They found that the F and R-S scales correlated positively and significantly for the entire population, but that the results of the other correlations were inconclusive. They found no differences between the different sex groups of subjects.

The research in the area of sex differences leaves doubt as to whether males will tend to be more field independent than females on all measures of field dependency. It seems that the characteristics of the field dependent female may be different from those of the field dependent male. Certainly consideration of sex related traits, in addition to sex itself, seem crucial for consideration in any study related to the dimension of field independence. Generalizations from one sex to the other have to be experimentally demonstrated.

A number of studies are reported which attempt to relate field dependency with anxiety, ego strength and distractability. Talf and Coventry (1958) separated subjects by the neuroticism and extraversion scales on the Cattell 16 PF test. They found no differences between the high and low subjects on the neuroticism scales, but did find that subjects who scored high on the introvert scale tended to do better on the Tilting Chair and the Rod and Frame tests. Silverman, Cohen, Shmavonian, and Greenberg (1961) postulated that subjects who rely more on external rather than internal cues would react differently to an experiment in which external cues were lacking. The DAP and the EFT were administered to male college students to determine extent of field dependence. Five body-oriented (field dependent) subjects and six field independent ones were placed in a low-sensory environment for two hours. The field dependent subjects performed more poorly on pre- and post

experiment two point discrimination and letter identification tasks; remained more aroused, as measured by the GSR and EEG; and tended to move around more. Postexperimentally they expressed more discomfort about the experiment, struggled more with feelings and fantasies experienced (or denied them), were more suspicious and projected internal percepts more. Adevai, Silverman and McGough (1968) related the EFT with MMPI scales, controlling for male and female differences. They found that for both sexes field dependent subjects tended to score higher on the F-scale. This is the only scale that was found to be significantly correlated with the EFT. The Taylor A scale and the Barron Ego Strength scale were not significantly correlated. In another study Adevai et al. (1968) found that groups which scored on the high ego strength extreme of the Ego Strength scale were better on the EFT. Weiss, Stein, Atar and Melnik (1968) used college females for subjects and administered the EFT, the Rorschach and the Ravens. The subjects who scored lowest on the EFT were compared with those who scored highest with regard to number of variables including W, D, M, C and Y responses on the Rorschach. The results appeared to support a theory of ego control or delay of impulse discharge interpretation. However, Wender, Pedersen and Waldrop (1966) in working with very young children found that scores on the Children's Embedded Figures Test did not correlate significantly with measures of sustained directed activity.

Again the literature seems to indicate that the relationship of field dependency with such variables as anxiety and distractability is different when sex and age are taken into consideration.

On a purely cognitive vein, experiments by Karp (1963), Goodenough and Karp (1961) and Karp (1958) have led these experimenters to feel that the EFT,

along with certain Wechsler subscales (arithmetic, block design, and object assembly), define a factor of overcoming embeddedness. Although this factor is related to a factor defining distractability, it has been demonstrated that it is a separate factor (Karp, 1963). Goodman (cited by Witkin et al., 1962) postulated a relationship between field dependency and flexibility of closure and a significant correlation was found between them. Gardner, Jackson and Messick (1960) found tests of field dependency and flexibility of closure defined a single factor. Advai et al. (1968) found that the EFT was related to spatial IQ tests and might be used as a screening device for extreme RFT groups. Bigelow (1967) found no relationship between intelligence as measured by the Peabody Picture Vocabulary Test and the Children's Embedded Figures Test. However, Kessler and Kronenberger (1967) tested on the Kohs Blocks high and low subjects on the EFT. He concluded that the ability measured by the EFT is highly related to perceptual synthesis performance.

In their book Witkin et al. (1962) stated that the field dependent person is less likely to do as well as the field independent person on Duncker's insight problems since they may not readily see alternative uses for items serving a familiar function. Karp (1963) indicated that both the insight and the match problems load heavily on factors that include what he calls "overcoming embeddedness". Mendelsohn, Griswold and Anderson (1966) found that the Gottschaldt Figure Test, the test from which Witkin devised the EFT, correlated significantly with anagram solving. Gardner, Holzman, Klein, Linton and Spence (1959) did a factor analytic study of a number of tests including the Embedded Figures Test and the Rod-and-Frame Test. For males they found high loadings on a scanning factor and size estimation tasks (especially

with the EFT; $r = .40$). Extreme scanners tended to produce impersonal, intellectualized responses on the Rorschach. For females it was found that those who were high in a factor defining field articulation and flexibility tended to have less difficulty with the EFT and RFT tests. However, League and Jackson (1961) found no relationships between measures of field dependence and measures of activity and passivity. To measure activity and passivity they used leaderless groups, a modified group Rorschach and a modification of Jackson's Incomplete Sentence Test of Passivity. The EFT was used as the measure of field dependency.

Although the literature seems to support a contention that field independent subjects tend to do better on problem solving tests, it does not clarify the reasons why this is so. Also, it is apparently unsafe to generalize from the cognitive aspects of activity attributed to the field independent person to other areas of psychological activity.

A group of studies have indicated the relationship of field dependency, to age. Witkin, Goodenough, and Karp (1967) did a longitudinal study of two groups of subjects, one group between the ages of eight and thirteen years, and the other between the ages of 10 and 24 years. The sexes were evenly distributed between the two groups. They found that for all subjects field independence increased until 17 years of age with no further change. They also found individual consistency for both sexes across the ages examined. Bigelow (1967) used different age groups, between five and ten year olds. He found no relationship between a children's form of the Embedded Figures Test and Intelligence as measured on the Peabody Picture Vocabulary Test. He did find that the single best predictor for scores on the Embedded Figures Test was

age, and that there was no difference in scores between boys and girls. For the aged Karp (1967) and Schwartz and Karp (1967) found that field dependency increases with old age. However, employed old people, especially employed males, tended to be more field independent. It would appear from these studies that the variable remains relatively stable during the middle ages and varies more in youth and old age.

The Children's Manifest Anxiety Scale

In 1956 Castaneda, McCandless, and Palermo published a childrens form of the Taylor Manifest Anxiety Scale. This scale is identical in form with the Taylor, changed only to conform to the reading ability and life of the child. It was designed specifically for use with 4th, 5th, and 6th grade children. Stone, Rowley, and Keller (1965) gave norms for 7th, 8th, and 9th grade students. Since its publication a number of studies have been executed to establish its validity. Palermo, Castaneda and McCandless (1956) selected 36 subjects from the group of students used to obtain norms for the CMAS. They formed two groups of subjects who scored in the upper and lower twenty percent of the total population. All subjects participated in a complex visual learning situation which had immediate feedback to correct responses. The results indicated that the high anxious subjects produced more errors and were slower to learn. These results were in accord with those found by Taylor for adults. Castenada, Palermo and McCandless (1956) selected a high and low anxious group and presented them with the same type of learning tasks. However, they presented varying degrees of difficulty in the task. Again the results were similar to those found with adult subjects. McCandless and

Castaneda (1956) correlated CMAS scores with achievement test scores and the Otis Intelligence Test for three grades, the 4th, 5th, and 6th. Significant correlations were found only in the 6th grade and these correlations were greater for girls than for boys. For 6th grade girls, the correlation between the CMAS and the Otis was $-.43$. Rowley and Stone (1963) found that the CMAS correlated negatively in general with the subscales of the WISC, but that none of these correlations were large enough to be significant. Cowen, Zax, Klein, Izzo and Troat (1965) found a similar significant negative correlation between the Otis and the CMAS. They also found a correlation between the CMAS and teachers' ratings of maladjusted behavior in the classroom. Higher CMAS scores were related to greater maladjustment. Penney (1965) also found the same significant negative correlation with intelligence and with a measure of reactive curiosity.

Smock (1958) studied the relationship of anxiety scores and perceptual rigidity. His perceptual rigidity test consisted of cards that progressively approximated a particular object and they progressively changed to another object. He found evidence to support the hypothesis that anxiety is related to perceptual rigidity and that high anxious subjects are less responsive to environmental clues.

Lot and Lot (1968) found no relationship between scores on the CMAS and learning task performances. They did find a relationship with intelligence and social standing, both in a negative direction.

Finally Hafner, Quast, Speer and Granis (1964) found that the CMAS could differentiate between children in psychiatric wards and children in pediatric wards. They also found that although the scale did not correlate

with professional ratings of clinical anxiety, it did correlate significantly with psychiatric signs, and with parental ratings of their childrens' anxiety.

Problem Solving

Rimoldi's problems were developed from research on thinking processes in the medical diagnosis situation (Rimoldi, Haley, and Fogliatto, 1962). Since their initial work a number of problems have been developed which can be given to all ages except the preschool age (Rimoldi and VanderWoude 1967). Much of the research has been devoted to the development of the problems and a system of scoring them. Two things of importance to this study have been developed. First, the problems differentiate their intrinsic difficulty, their logical structure, from an extrinsic difficulty, the language used in expressing the problem. Also, the problems have been shown in their scoring to differentiate clearly between good and poor problem solvers (Erdmann 1967). Because of the ability of this instrument to score the logical process of the subject, it seems appropriate for use in testing out Witkin's theory of an analytical cognitive approach.

The problems have been used in conjunction with Rokeach's scale for open and closed-minded people (Robb, 1966). No differences were found for the open-minded group on different language presentations, but differences were found for the closed-minded group.

CHAPTER III

Method

Subjects

The 7th and 8th grade students at two large, parochial (Catholic) grade schools in Chicago, Illinois formed the subject pool. The two schools are in the same area of the city, and the subjects came from the same ethnic and income groups. All the children took both the CMAS and HFT. All subjects for whom data were complete (scores on the CMAS, HFT, Otis) were included in the first portion of the study.

Subjects for the second portion of the study were selected on the basis of the following criteria:

Sex: Females only.

Intelligence: Only those who scored between 90 and 115 on the Otis were selected. Both schools administer the Otis at the beginning of the 7th grade.

Language familiarity: Each child was asked to indicate how much English was spoken in his home on a five point scale. The five points were: never, seldom, about half the time, most of the time, and always. Those girls who indicated that English is never or seldom spoken in their home were excluded

Measures

Hidden Figures Test (HFT): This test was developed by Witkin as the group form of the EFT. It consists of 32 complex figures and 5 simple

figures. One of the 5 simple figures is hidden or embedded in each of the complex figures. (Append. I). Thirty minutes is allowed for the test.

This test is scored by the number of simple figures the subject can correctly identify in the complex figures.

Children's Manifest Anxiety Scale (CMAS): This test was developed by Castaneda, McCandless, and Palermo (1956) and patterned after the Taylor Manifest Anxiety Test. It is given in group form with no time limit. (Append. II). The CMAS is scored by the number of statements which are answered "true".

Rimoldi's Problems: (Rimoldi, 1968) Three problems were selected:

31K' which is a concrete problem dealing with form and color.

31A' which is presented in simple concrete words.

31B' which is presented in abstract algebraic language.

All three problems have the same logical structure and require the same logical process to solve. (Append. III). The scoring of Rimoldi's problems takes into account two possible tacks. The first tack goes from the more general to a more specific question, and is considered the ideal tack. The second asks all specific questions (in this case three) to come to a conclusion. This tack is considered less ideal. The scoring is based on the closeness of approximation to the ideal tack. A person who asks 2 questions, a general and a specific question, in that order, gets a perfect score. Any other combination of questions, in any other order, gets a less perfect score. The general question is scored 2 points, the specific, 1 point. If asked in the wrong order, i.e., the specific prior to the general, the specific gets $\frac{1}{2}$ point. Total points are divided by the number of questions

asked. If both tacks are present, the scoring is based upon the ideal tack. In the case of this experiment, the total points of each subject were divided by the ideal total points (1.5) in order that the results would be consistent with results obtained in previous studies using these problems.

Procedure

The HFT and CMAS were administered to all the seventh and eighth grade students in both schools. At one school the HFT was given first, and at the other the CMAS was given first. Of the subjects selected for the second portion of the study, half were selected at random for the distractibility (stress) condition.

Preliminary testing of the 6th grade students indicated that before the subjects could understand what was expected of them in the problem solving task, two practice problems were necessary; one worked out by the examiner, and one worked out by the subject with the examiner's assistance. It was also determined that two examiners could administer the problems in a group as long as the number of subjects did not exceed 10 at one time.

The following instructions were used as the clearest for the children to understand:

"You are about to be involved in some problems which require solutions. These problems are like detective problems because you will not find the answer directly, but you will come to the answer indirectly by deducing it from clues. You will get these clues by asking certain questions and having these questions answered. Let me show you how you do it by this problem on the board (or sheet of paper if no board is available).

You see these four squares?

1	2
3	4

They are numbered 1,2,3,4. I have chosen one of these squares and it is your job to find out which one I have chosen. Now you can do that by asking one or two or three or four or five of the following questions:

1. Is it in the top half?
2. Is it #1?
3. Is it colored red?
4. Is it in the left half?
5. Is it #3?

I will tell you the answer to the question as you ask it."

These are your clues to pick out the square that I have chosen. Now which question would you ask first? (When one of the subjects ask any one of the questions, the examiner then stated) You have chosen to ask question #___ first. Now look at your answer sheet. You will notice it says on top, "order of questions asked." The first question you asked was question #___. You will put the number of that question first, here on your answer sheet. (A sample of the answer sheet is drawn on the board or paper for all to see.) Now the answer to that question is___. Can anyone answer the problem yet? No, not yet except by guessing, because you need more information to answer the problem, more clues. Now what is the second question you would want to ask?

This procedure was followed until the problem was solved by a subject. The examiner then stated:

You noticed that you did not get the answer directly from the questions, that is, you did not ask a question and find that my answer to any one question was the answer to the problem. You

did get the answer by being led to it by the clues you received from asking the questions. Now open your problem marked "Sample Problem" and spread the questions on the table so you can see them all. Let me read the problem with you and help you work it out.

After the subjects had their problem spread out in a way that they could read all the questions, the examiner read the problem and he and his assistant helped any of the subjects who needed it. After they spread out the problem he said:

Now read through all the questions and try to work the problem. Remember to try to ask only those questions which will lead you to the answer.

After the sample problem was worked correctly the examiner stated:

Now you will work the three problems you have in this order, 31K', 31A', and 31B'. Do not wait to be told to go on to the next problem after you finish one. Now take out problem 31K' and let me read it with you. (After the problem was read he stated:) You understand that the questions are a little different in this problem. You ask the card, 'Is the particular figure that I am looking for on this card?' You will find the answer on the back of the card, as you did in the practice problem. Now go ahead and work the problems.

For the nonstress condition the following instructions were added: "You will have plenty of time so take your time."

For the stress condition, these words were substituted: "You will be timed so you have to go as fast as you can, or you will not finish."

Periodically as the stress groups were working the problems, the examiner, with stopwatch in hand, yelled at them to hurry up, suggested that they were almost out of time, and that they were working too slow.

Both the examiner and his assistant mingled with the subjects, making sure they were putting down the questions appropriately, and were not looking at more questions than they had written on the answer sheet. In the preliminary testing with the 6th grade students, it was found that all the

subjects understood what they were to do after this instruction. During the study, it appeared that the majority of the students understood the instructions and were able to attempt the problems without need for further assistance.

CHAPTER IV

RESULTS

The first five hypotheses were tested by t tests and Pearson Product Moment correlations; subjects were all children who had taken the CMAS, and HFT and for whom an Otis result was on record. A small number of potential subjects were excluded because they indicated that very little English was spoken in their homes. Some few others were unable to participate in the experiment because they were not able to obtain parental approval. A total of 266 subjects, 132 boys and 134 girls, were used in this portion of the investigation.

Table 1 indicates the means and standard deviations for the girls and the boys on all three tests. The means for the girls were significantly higher than the boys on the CMAS ($p < .02$) and was significantly lower than the boys on the HFT ($p < .01$). These results supported hypotheses 1 and 2 which stated that males tend to be more field independent than females and that females tend to be more anxious than males.

Table 2 shows the correlations among all three tests for boys and for girls. For girls, all three correlations were significant. The CMAS was negatively correlated with the HFT and the Otis, and the HFT was positively correlated with the Otis. These results supported hypotheses 3 and 5 which stated that field dependency is directly related to anxiety, and that anxiety is inversely related to intelligence. They did not support hypothesis 4

which stated that field dependency is not correlated with intelligence. For boys, the only significant correlation was a positive one between the HFT and the Otis. These results did not support any of the three hypotheses (3,4, and 5); the significant positive correlation between field independence and intelligence was not in the predicted direction.

All subjects in the second portion of the investigation were randomly assigned to either the stress or nonstress condition. The problem solving data were analyzed by dividing the subjects in the second portion of the study into groups. The division of the groups on the HFT and on the CMAS variables was done by dividing the total group at the median on each variable, thus forming high and low HFT groups and high and low CMAS groups. Extreme groups of $N = 15$ were subsequently selected from these high and low groups on each variable.

Tables 3 and 4 present the means of the various groups as they were divided for the HFT and the CMAS variables. In dividing the subjects at the median, those subjects who scored at the median were randomly placed in the high or low groups. Figures 1,2, 3 and 4 present the graphic representation of these means.

A multivariate analysis of variance was computed according to the method presented by Morrison (1967). In this analysis the four curves are tested for parallelism. If parallelism can be established, any interaction between the four groups can be rejected. Parallelism was tested by using the Heck Charts presented by Morrison (1967), which reject at the .05 level. A simple analysis of variance was used to test the differences between the

TABLE 1

Total Number of Subjects, Means, Standard Deviations and ts for
Girls and Boys on the CMAS, HFT, and Otis I.Q. Test

Girls	N=134	CMAS	HFT	IQ
	Mean	18.78	10.32	109.63
	<u>SD</u>	7.82	4.80	11.31
Boys	N=132			
	Mean	16.58	12.05	108.72
	<u>SD</u>	6.14	5.56	12.37
	<u>t</u>	2.55*	2.73**	
		*-p.02	**p.01	

TABLE 2

Pearson Product Moment Correlations for Girls and Boys between
CMAS, I.Q., and HFT Scores

<u>Girls</u>	CMAS	HFT
I.Q.	-.29*	.44*
HFT	-.39*	
<u>Boys</u>		
I.Q.	-.03	.22*
HFT	.08	

* $p < .01$

TABLE 3

Means of the Three Problems for Groups Divided at the Median
and Extremes for the HFT

<u>Median Groups</u> ^a	<u>High HFT</u>			<u>Low HFT</u>		
	<u>31K'</u>	<u>31A'</u>	<u>31B'</u>	<u>31K'</u>	<u>31A'</u>	<u>31B'</u>
Stress	.31	.58	.41	.29	.51	.41
Nonstress	.28	.59	.47	.25	.60	.41
<u>Extremes Groups</u> ^b						
Stress	.28	.58	.38	.28	.50	.41
Nonstress	.30	.61	.48	.23	.66	.38

^a High above the score of 9, low below the score of 9.

^b High above the score of 10, low below the score of 8.

TABLE 4

Means of the Three Problems for Groups Divided at the Median
and Extremes for the CMAS

<u>Median Groups^a</u>	<u>High CMAS</u>				<u>Low CMAS</u>	
	<u>31K'</u>	<u>31A'</u>	<u>31B'</u>	<u>31k'</u>	<u>31A'</u>	<u>31B'</u>
Stress	.33	.55	.41	.26	.52	.39
Nonstress	.27	.59	.45	.27	.60	.44
<u>Extremes Groups^b</u>						
Stress	.28	.54	.40	.26	.53	.37
Nonstress	.29	.64	.47	.29	.68	.42

^a High above the score of 21, low below the score of 21

^b High above the score of 24, low below the score of 16

groups defined by variable and stress condition and Hotelling's T^2 Test from which an F is derived, was used to test for equivalence of the three measures (problems).

Table 5 presents the Θ values used in conjunction with the Heck Charts. None of the Θ values were equal to or greater than the critical values presented in the charts. Therefore, parallelism between the groups is accepted at the .05 level of confidence, and any significant interaction between the measures, the conditions of stress and nonstress and the CMAS and HFT variables is rejected.

Table 6 shows the F values for comparing the different groups. None of these F 's were significant. The only F that tended toward the predicted direction was that of the CMAS group divided by selecting the 15 high and 15 low subjects. An inspection of Figure 4 indicates that this tendency is probably due to the stress and nonstress conditions, indicating that the stress condition may have hindered the performance of the subjects slightly.

These results did not support any of the hypotheses for the second part of this investigation; i.e., that field independent girls are better problem solvers than field dependent ones; that high anxious subjects are poorer problem solvers than low anxious subjects; that field independent girls are not as affected by stress as field dependent girls; and that high anxious subjects are more affected by stress than low anxious subjects.

Table 7 shows the F values for comparison of the three measures (problems). All of these F 's were significant beyond .01 level.

Because of the differences shown in the subjects' ability with each of the problems, the groups were analyzed on each problem separately by

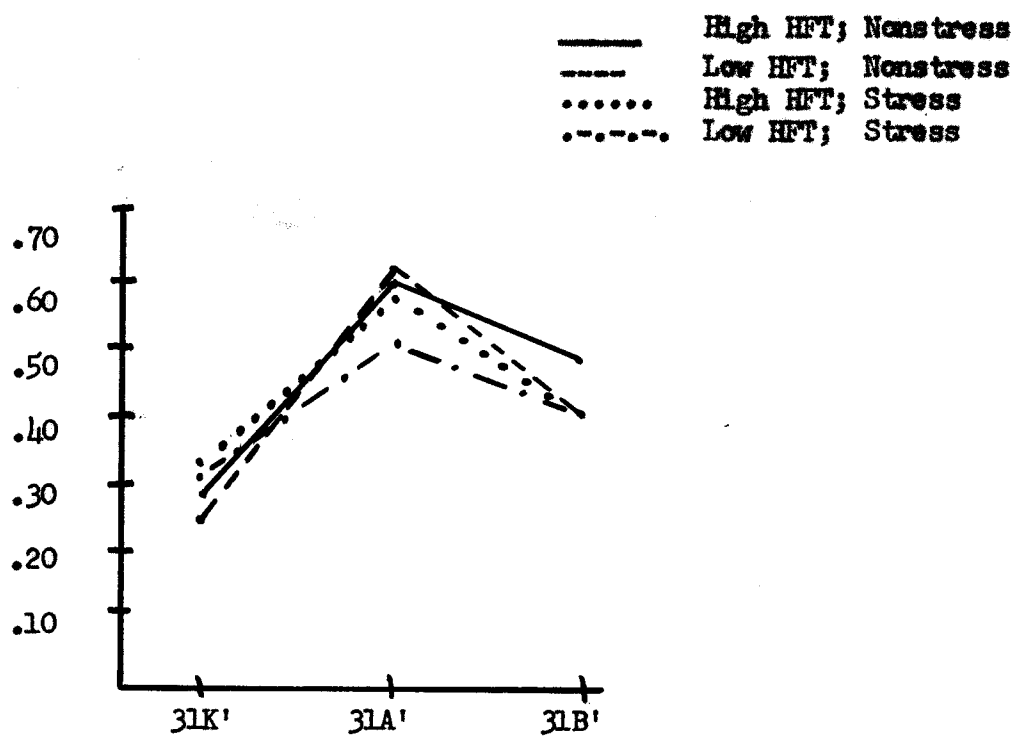


Figure 1 Graph of HFT Variable Median Groups

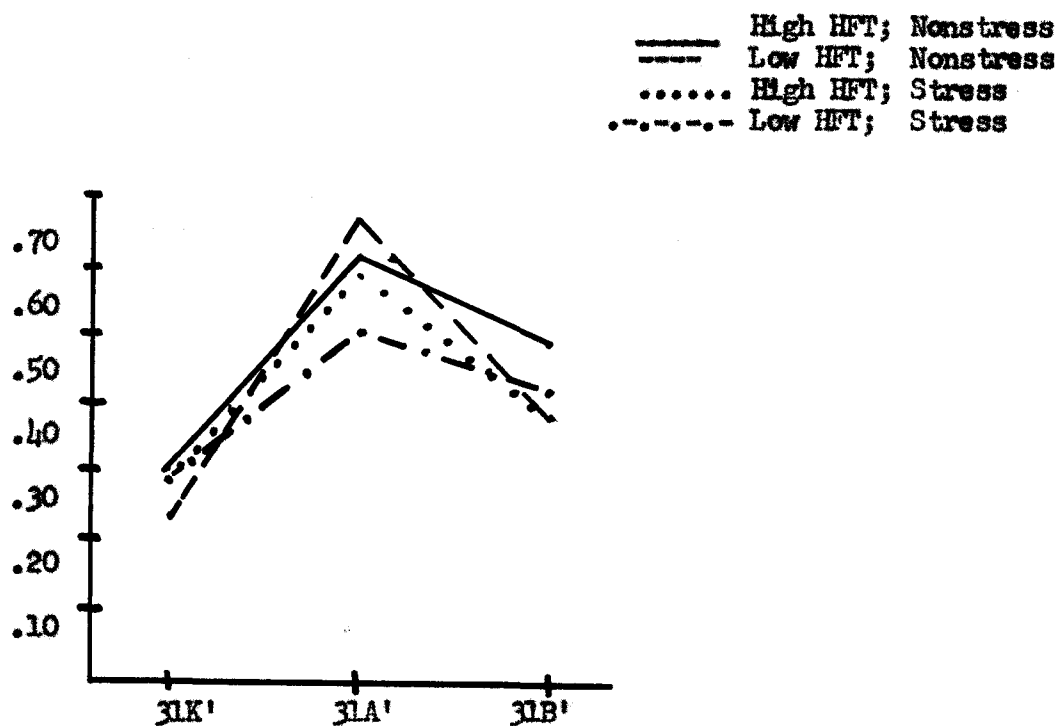


Figure 2 Graphs of HFT Variable: Extremes Groups

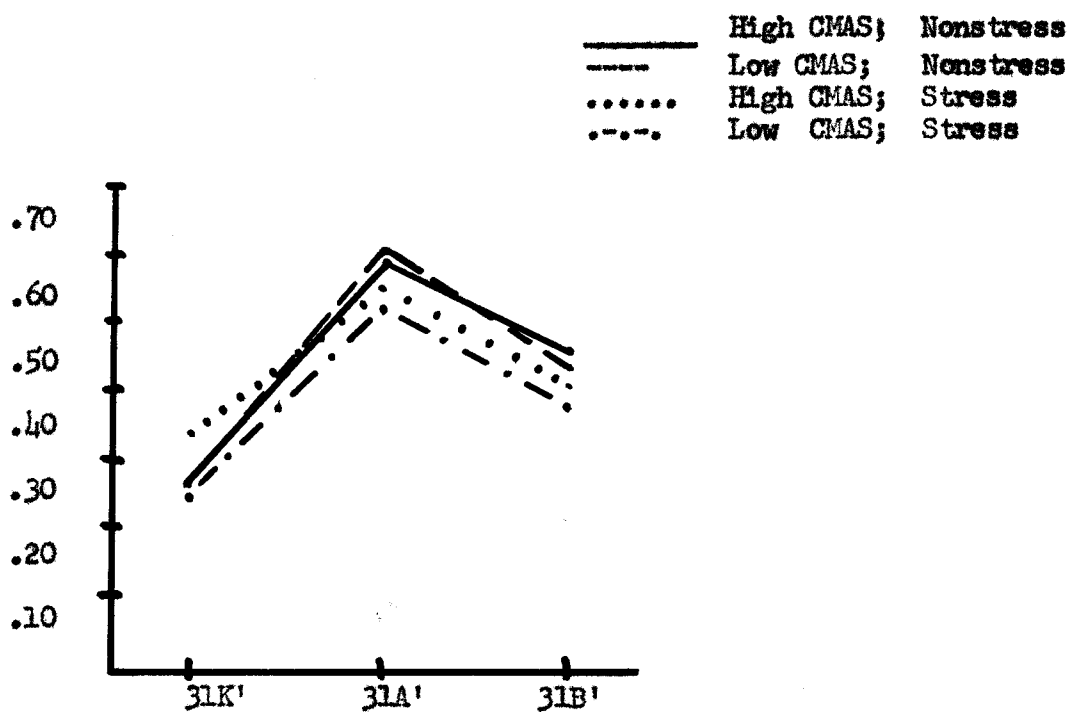


Figure 3 Graph of CMAS Variable: Median Groups

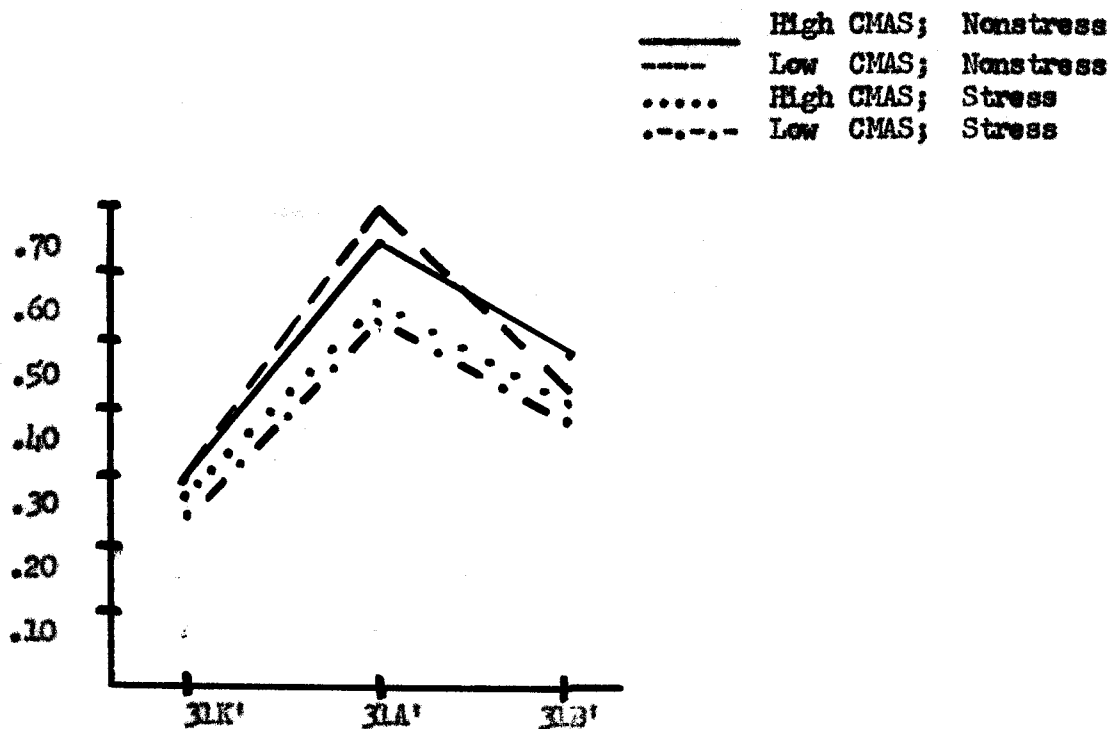


Figure 4 Graph of CMAS Variable: Extremes Groups

TABLE 5

⊖ Values for Heck Charts
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	<u>HFT</u>	<u>CMAS</u>
Median Groups	.05	.06
Extremes Groups	.15	.06

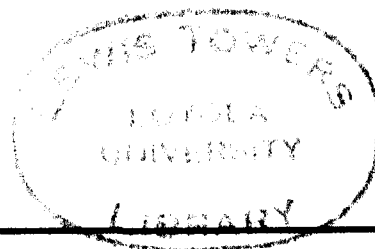


TABLE 6

F Values

	<u>HFT</u>	<u>CMAS</u>
Medians Groups	0.50	0.59
Extremes Groups	0.68	1.69

computing the F values from a 2x2 analysis of variance.

Table 8 shows the summary of the analysis of variance for the HFT groups, median and extremes, for problem 31K'. There were no significant F values, and none which seemed to tend in the predicted direction. These results did not support any of the hypotheses for the second section of the study.

Table 9 is a summary table of the analysis of variance for the HFT groups, median and extremes, for problem 31A'. The only F that approached significance is in the extremes groups for the main effect of the stress condition ($p < .10$). This tended to support the indication that the stress condition hindered the performance of the subjects on problem 31A'. The F value for the interaction between the stress condition and the HFT variable tended in the predicted direction. This tendency gave some slight support to hypothesis 7 which stated that field independent girls are not as affected by stress as field dependent girls. Since F values did not attain high levels of significance, the support was minimal. These results do not support hypothesis 6 which stated that field independent girls are better problem solvers.

Table 10 shows the summary of the analysis of variance for the HFT groups, medians and extremes for problem 31B'. There are no F values that are significant. The only F value that tended in the predicted direction is for the interaction between the stress condition and the HFT scores with the extreme subjects. Again this gave minimal support for hypothesis 7 which stated that field independent girls are not as affected by stress as field dependent girls. These results do not support hypothesis 6 which stated that

TABLE 7

F Values for a Comparison of the Three Problems

	<u>HFT</u>	<u>CMAS</u>
Medians Groups	70.71*	70.97*
Extremes Groups	57.59*	57.75*

* $p < .01$

TABLE 8

Summary Tables of Problem 31K' for HFT Groups,
Median and Extremes

Median Groups

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
HFT	0.01	1	.01	.35
Stress	0.02	1	.02	.76
S x HFT	0.01	1	.01	.25
Within SS	2.11	81	.03	
Total	2.14	84		

Extremes Groups

HFT	0.02	1	.02	.74
Stress	0.00	1	.00	.00
S x HFT	0.02	1	.02	.49
Within SS	1.73	56	.03	
Total	1.77	59		

TABLE 9
Summary Tables of Problem 31A¹ for HFT Groups,
Median and Extremes

Groups

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
HFT	.03	1	.03	.59
Stress	.07	1	.07	1.56
S x HFT	.03	1	.03	.68
Within SS	3.69	81	.05	
Total	3.82	84		

Extremes Groups

HFT	.00	1	.00	.00
Stress	.14	1	.14	3.48*
S x HFT	.06	1	.06	1.53
Within SS	2.21	56	.04	
Total	2.42	59		

*p < .10

TABLE 10

Summary Tables of Problem 31B' for HFT Groups,
Medians and Extremes

Median Groups

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
HFT	.02	1	.02	.97
Stress	.03	1	.03	1.24
S x HFT	.02	1	.02	.63
Within SS	2.04	81	.03	
Total	2.11	84		

Extremes Groups

HFT	.02	1	.02	.76
Stress	.01	1	.01	.44
S x HFT	.06	1	.06	2.38
Within SS	1.47	56	.03	
Total	1.56	59		

field independent girls are better problem solvers.

Table 11 shows the summary of the analysis of variance for the CMAS groups, median and extremes for problem 31K'. There were no significant F values, and none which tended in the predicted direction. These results do not support hypotheses 8 and 9 which stated that high anxious subjects are poor problem solvers, and that high anxious subjects are more affected by stress than low anxious subjects.

Table 12 is a summary table of the analysis of variance for the CMAS groups, median and extremes for 31A'. The only significant F value was for the stress condition in the extremes groups. There was a tendency for the reflection of this significance when the group was divided at the median. This would indicate that the stress condition lowered the scores on problem 31A'. These results do not support hypotheses 8 and 9 with regard to anxiety.

Table 13 is a summary table of the analysis of variance for the CMAS groups, median and extremes for 31B'. There were no significant F values. There were two values which tended in the predicted direction, both of these for the stress condition. These results lend minimal support to the indication that the stress condition caused slightly less performance on problem 31B'. These results do not support hypotheses 8 and 9 which stated that high anxious subjects are poor problem solvers, and that high anxious subjects are more affected by stress than low anxious subjects.

TABLE 11

Summary Tables of Problem 31K' for CMAS Groups,
Median and Extremes

Median Groups

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
CMAS	.02	1	.02	.85
Stress	.01	1	.01	.49
S x CMAS	.03	1	.03	1.03
Within SS	2.06	81	.03	
Total	2.12	84		

Extremes Groups

CMAS	.00	1	.00	.05
Stress	.01	1	.01	.23
S x CMAS	.00	1	.00	.00
Within SS	1.30	56	.02	
Total	1.31	59		

TABLE 12

Summary Tables of Problem 31A' for CMAS Groups,
Median and Extremes

Median Groups

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
CMAS	.00	1	.00	.00
Stress	.08	1	.08	1.77
S x CMAS	.01	1	.01	.13
Within SS	3.72	81	.05	
Total	3.81	84		

Extremes Groups

CMAS	.00	1	.00	.00
Stress	.24	1	.24	5.91*
S x CMAS	.01	1	.01	.20
Within SS	2.30	56	.04	
Total	2.55	59		

*p < .02

TABLE 13

Summary Tables of Problem 31B¹ for CMAS Groups,
Median and Extremes

Median Groups

<u>Source</u>	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>
CMAS	.00	1	.00	.00
Stress	.04	1	.04	1.68
S x CMAS	.00	1	.00	.00
Within SS	2.00	81	.03	
Total	2.05	84		

Extremes Groups

CMAS	.03	1	.03	.99
Stress	.06	1	.06	2.28
S x CMAS	.00	1	.00	.00
Within SS	1.40	56	.03	
Total	1.48	59		

CHAPTER V

Discussion

As was predicted from the literature, boys scored significantly higher than girls on the HFT ($p < .01$) and significantly lower on the CMAS ($p < .02$). Thus hypotheses 1 and 2 were supported by the results. The latter finding on the CMAS tended to support the finding of Castaneda et al. (1956 but not that of Stone et al. (1965), who reported no sex differences.

Hypothesis 3 predicted a negative correlation between the HFT and CMAS; it was supported by the results for girls ($r = -.39$; $p < .01$) but not for boys ($r = .08$). These results supported Witkin's et al. statement (1962) that field dependent subjects tend to be more anxious than field independent subjects for girls only. Hypothesis 4 predicted no relationship between HFT and IQ scores; it was not supported. In fact, for girls there was a correlation of .44 between HFT and IQ scores; for boys there was a correlation of .22. Both were significant at the .01 level. Hypothesis 5 predicted a negative correlation between CMAS scores; it was supported for girls ($r = -.29$; $p < .01$) but not for boys ($r = -.03$).

It is impossible to come to any conclusions from this study as to why these measures are correlated so highly among girls and not among boys. A sex difference was expected, but not to this degree. Results confirmed the necessity of controlling for sex when dealing with cognitive and personality

variables in children.

The correlation between HFT and IQ scores was the only one that was significant for both boys and girls. These results lended support to the findings of Adevai et al. (1968) that the EFT was related to spatial IQ tests; and to the findings of Karp (1963) and Goodenough and Karp (1961) and Karp (1958) that tests for field dependence are related to the arithmetic, block design, and object assembly subtests of the Wechsler. They did not lend support to Bigelow's findings (1967) of no relationship between the EFT and Peabody. The present results suggest a relationship with global intelligence that have not yet been explored, but would seem to merit substantial investigation.

It would appear from the literature and the present results that the relationship between field dependency and intelligence depends on the tests used to measure both variables. It would also appear that the use of a visual discrimination task such as the EFT or the HFT to measure field dependency must take into consideration that this task has a relationship with some measures of intelligence, and that intelligence must be considered in interpreting the results.

The second section of this study did not support any of the hypotheses proposed. Since there was little evidence in the results that the stress condition lowered scores on the problem solving tasks, it appears that the hypotheses involving stress either do not hold or were not adequately tested. These hypotheses were that field independent girls, as measured by the HFT, would be better problem solvers than field dependent girls under the stress condition and that low anxious girls, as measured by the CMAS, would be better

problem solvers than high anxious girls under the condition of stress. Simple distraction and time pressure on the subjects did not produce enough stress to produce significant effects.

However, the results also did not support the hypotheses which did not involve stress, i.e., that field independent girls would be better problem solvers than field dependent girls in general, and that low anxious girls would be better problem solvers than high anxious girls in general.

The reason why these results differed from those suggested by Witkin et al. (1962) and found by Karp (1963) and by Mendelsohn et al. (1966) i.e., that field independent subjects are better problem solvers, is probably found in the relationship between the HFT and the Otis, and the fact that there was a control for intelligence in this study. Because of these two factors, the high and low groups in this study were not as different as those generally reported in the literature. The present results suggested that intelligence may have more to do with problem solving than field dependency.

The results concerning anxiety support those found by Horwitz and Armentrout (1965) and Lot and Lot (1968) who found no relationship between anxiety as measured by the CMAS and discrimination learning and task learning. If the problem can be considered a complex learning situation, these results do not support the contentions made by drive theory regarding the influence of anxiety. However, because of the relationship found between the CMAS and the Otis, it can again be stated that the extreme groups were not as separated as those generally found in the literature. Again these results suggested that intelligence may have more to do with problem solving ability than anxiety does.

The degree of differences found between the three problems is consistent with the results of Rimoldi et al. (1968) and has been discussed by Rimoldi (1967).

Because the results produced some tendencies which suggested that field independent subjects were better problem solvers under stress than field dependent subjects, an experiment which would control for intelligence and vary the stress conditions from mild stress, such as produced in this experiment, to severe stress, such as might be produced by suggesting that the subjects are failing and that the results of their problems will be part of their grade, might be productive of more significant results. If greater stress did create a more definite division between the high and low subjects on the HFT, it might be shown that this test is a better predictor of what a subject would do under stress than an anxiety scale. At least the tendencies in the present results suggest that this might be so for problem solving.

CHAPTER VI

Summary

Two hundred and sixty-six 7th grade and 8th grade students were tested on a perceptual discrimination task (Hidden Figures Test) and a measure of drive (The Children's Manifest Anxiety Scale). Otis IQ scores were also available. The HFT was found to be significantly positively correlated with the Otis for both boys and girls. The CMAS was found to be negatively correlated with the Otis for girls, but not for boys. The HFT was found to be significantly negatively correlated with the CMAS for girls, but not for boys. Boys were found to be significantly better on the HFT than girls. Boys were also found to answer significantly fewer questions on the CMAS as true.

Of the total group of subjects tested, 85 girls who scored between 90 and 115 on the Otis were tested on three of Rimoldi's problems under stress or nonstress conditions. An hypothesis was made that girls who scored higher on the HFT would do better on the problems than girls who scored lower both under stress and nonstress conditions. An hypothesis also was made that girls who scored lower on the CMAS would do better at problem solving both under stress and nonstress conditions. Neither of these hypotheses were supported by the results. A discussion of the results is presented.

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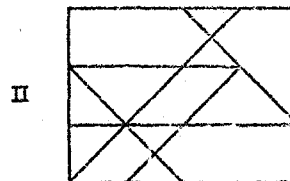
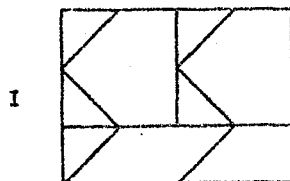
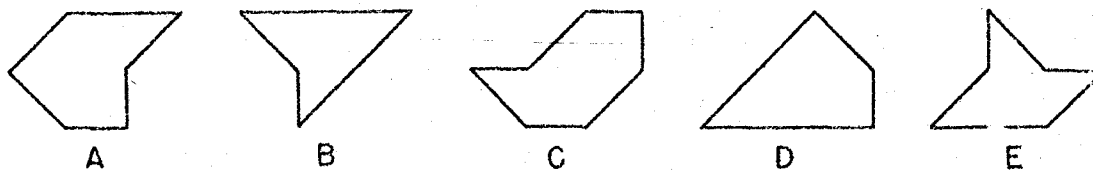
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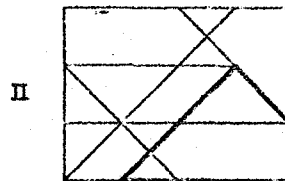
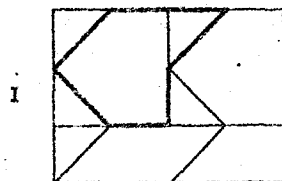
APPENDIX I

HIDDEN FIGURES

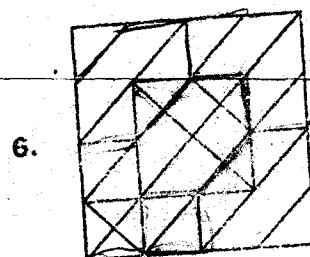
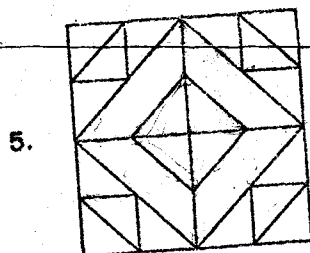
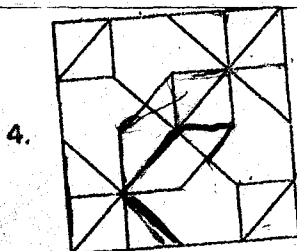
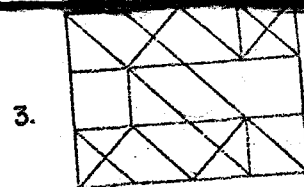
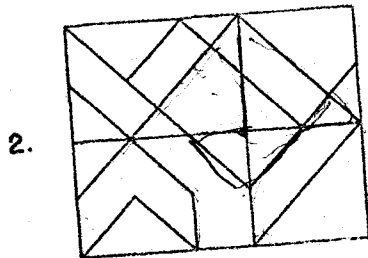
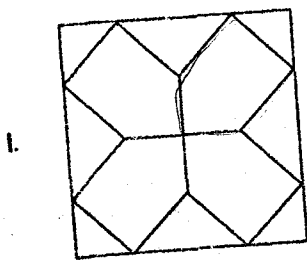
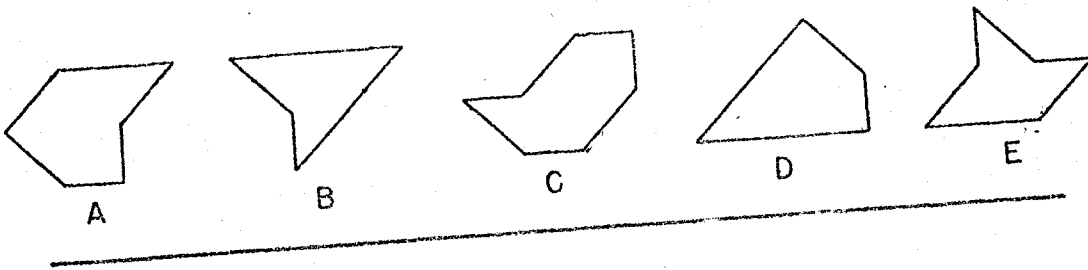
In this test you are to determine which one of five simple figures, the patterns lettered A, B, C, D, and E at the top of each page, is contained in each of the more complex problem figures. There is only one lettered pattern in each problem figure. The pattern will always be right side up and will be the exact size and shape of one of the lettered patterns at the top of the page. Try sample problems I and II; then check your answers with the figures in the box below.



The figures below illustrate how the patterns are included in the problem figures. Pattern A is contained in the first problem and pattern D in the second.

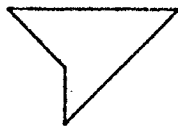


There are 16 problem figures in each section of this test and you will have 15 minutes for each section. Work as carefully and as quickly as you can. When you are given the signal, turn the page and begin working on the first section. Mark your answers on the answer sheet.





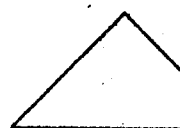
A



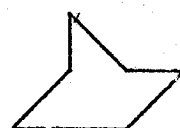
B



C

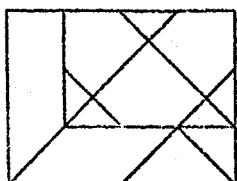


D

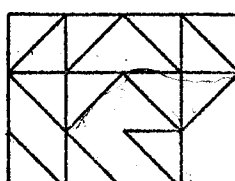


E

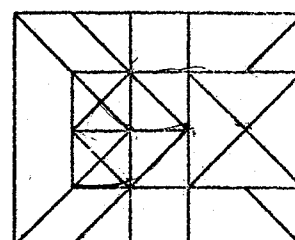
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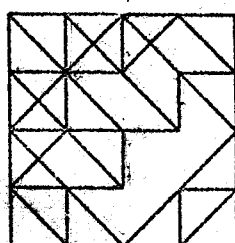
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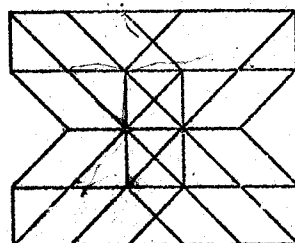
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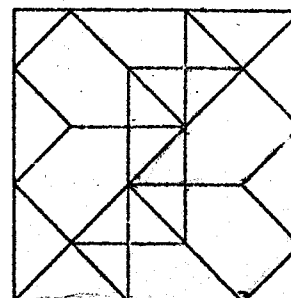
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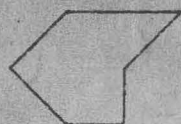


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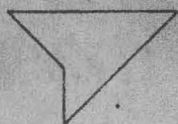


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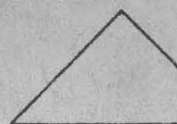
A



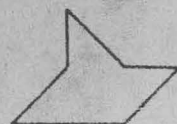
B



C

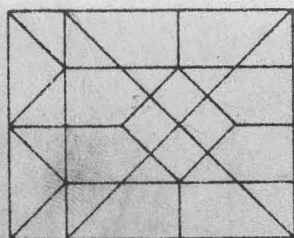


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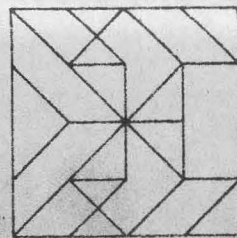


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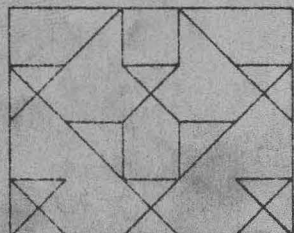
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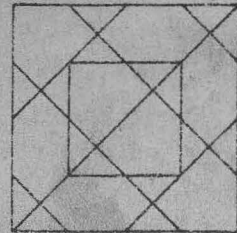
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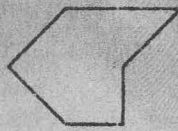


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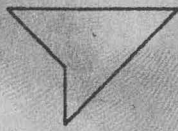


STOP

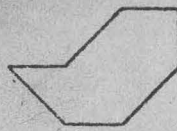
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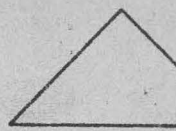
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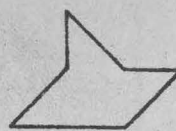
B



C

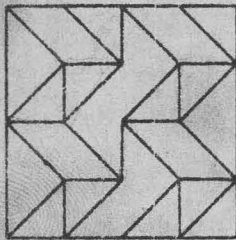


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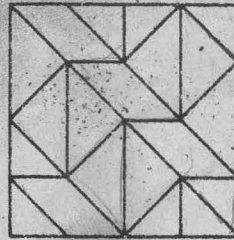


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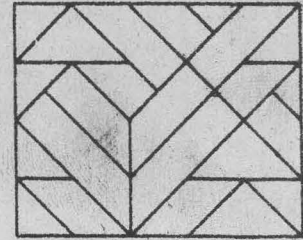
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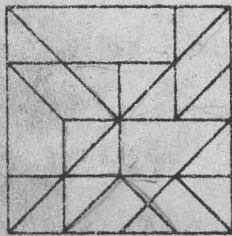
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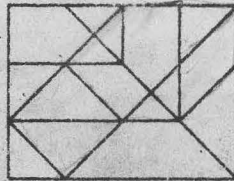
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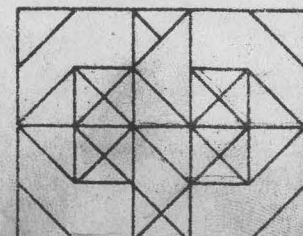
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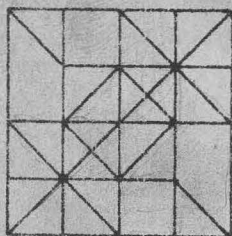
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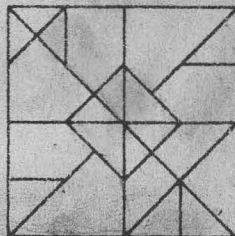
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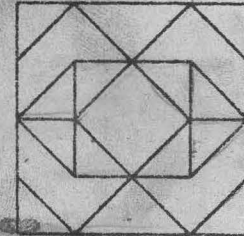
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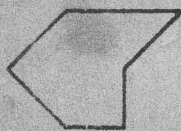
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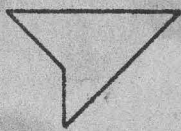
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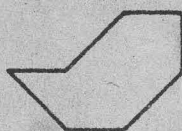
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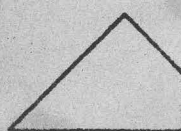
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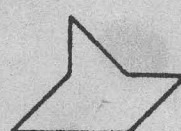
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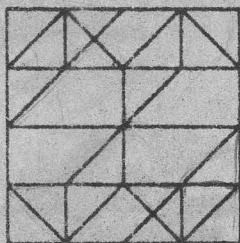


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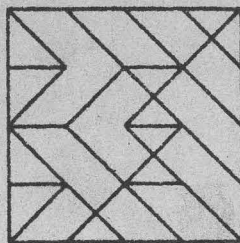


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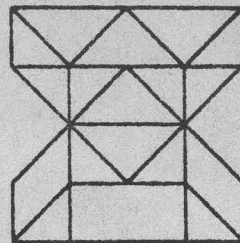
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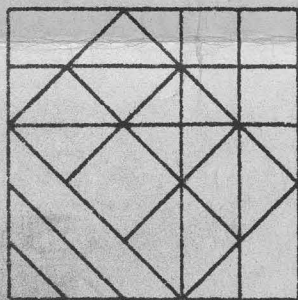
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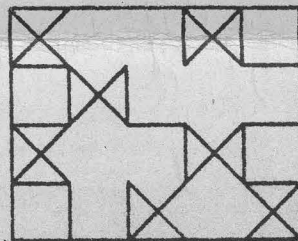
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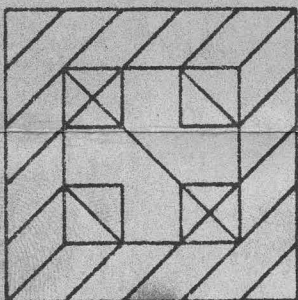
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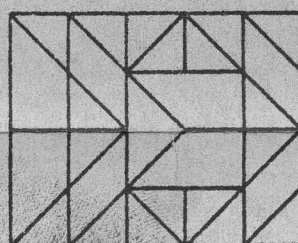
30.



31.



32.



DO NOT GO BACK TO PART 1, AND
DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

STOP.

APPENDIX II

Please circle Yes or No.

- | | | |
|---|-----|----|
| 1. It is hard for me to keep my mind on anything. | Yes | No |
| 2. I get nervous when someone watches me work. | Yes | No |
| 3. I feel I have to be best in everything. | Yes | No |
| 4. I blush easily. | Yes | No |
| 5. I like everyone I know. | Yes | No |
| 6. I notice my heart beats very fast sometimes. | Yes | No |
| 7. At times I feel like shouting. | Yes | No |
| 8. I wish I could be very far from here. | Yes | No |
| 9. Others seem to do things easier than I can. | Yes | No |
| 10. I would rather win than lose in a game. | Yes | No |
| 11. I am secretly afraid of a lot of things. | Yes | No |
| 12. I feel that others do not like the way I do things. | Yes | No |
| 13. I feel alone even when there are people around me. | Yes | No |
| 14. I have trouble making up my mind. | Yes | No |
| 15. I get nervous when things do not go the right way for me. | Yes | No |
| 16. I worry most of the time. | Yes | No |
| 17. I am always kind. | Yes | No |
| 18. I worry about what my parents will say to me. | Yes | No |
| 19. Often I have trouble getting my breath. | Yes | No |
| 20. I get angry easily. | Yes | No |
| 21. I always have good manners. | Yes | No |
| 22. My hands feel sweaty. | Yes | No |
| 23. I have to go to the toilet more than most people. | Yes | No |

24.	Other children are happier than I.	Yes	No
25.	I worry about what other people think about me.	Yes	No
26.	I have trouble swallowing.	Yes	No
27.	I have worried about things that did not really make any difference later.	Yes	No
28.	My feelings get hurt easily.	Yes	No
29.	I worry about doing the right things.	Yes	No
30.	I am always good.	Yes	No
31.	I worry about what is going to happen.	Yes	No
32.	It is hard for me to go to sleep at night.	Yes	No
33.	I worry about how well I am doing in school.	Yes	No
34.	I am always nice to everyone.	Yes	No
35.	My feelings get hurt easily when I am scolded.	Yes	No
36.	I tell the truth every single time.	Yes	No
37.	I often get lonesome when I am with people.	Yes	No
38.	I feel someone will tell me I do things the wrong way.	Yes	No
39.	I am afraid of the dark.	Yes	No
40.	It is hard for me to keep my mind on my school work.	Yes	No
41.	I never get angry.	Yes	No
42.	Often I feel sick in my stomach.	Yes	No
43.	I worry when I go to bed at night.	Yes	No
44.	I often do things I wish I had never done.	Yes	No
45.	I get headaches.	Yes	No
46.	I often worry about what could happen to my parents.	Yes	No
47.	I never say things I shouldn't.	Yes	No

- | | | |
|--|-----|----|
| 48. I get tired easily. | Yes | No |
| 49. It is good to get high grades in school. | Yes | No |
| 50. I have bad dreams. | Yes | No |
| 51. I am nervous. | Yes | No |
| 52. I never lie. | Yes | No |
| 53. I often worry about something bad happening to me. | Yes | No |

APPENDIX III

31A'

John has 20 horses. There are black race horses and white race horses. There are black farm horses and white farm horses. I want you to figure out how many black farm horses there are?

1. How many horses does John ride. Ans. 10.

2. How many white horses does John have? Ans. 7.

3. How many brown horses does John have? Ans. 0.

4. How many white racing horses does John have.
Ans. 5.

5. How many black racing horses does John have? Ans. 5.

6. How many brown racing horses does John have? Ans. 0.

7. How many white farm horses does John have? Ans. 2.

8. How many brown farm horses does John have? Ans. 0.

9. How many horses did John sell? Ans. 0.

10. How many ponies does John

have? Ans. 0.

We have 50 objects called C. There are two kinds of C's, one kind is called B, the other kind is called G. Any B can be either a R or a T, and any G can be either a B or a T. No B can be a G and no R can be a T. Will you find out how many of the G objects are also called T?

1. How many K's are there?

Ans. 11

2. How many R objects are also called G?

Ans. 15.

3. How many T objects are also called B?

Ans. 10.

4. How many N objects are there?

Ans. 10.

5. How much is K times C?

Ans. 550.

6. Are there more G than B objects?

Ans. No.

7. How many R objects are there?

Ans. 35.

8. Are there more R objects than T objects?

Ans. Yes.

9. Are there any objects called M?

Ans. No.

10. How many R objects are also called B?

Ans. 20.

31K'

Among a set of objects there are small green squares, large green squares, small blue squares and large blue squares. One of these types of squares has been selected. Your task is to discover which type of square has been selected. You may do this by picking up a card and "asking" if the boxes on this card are one of the selected type of objects. The answer to this question is given on the reverse side of the card.

1.



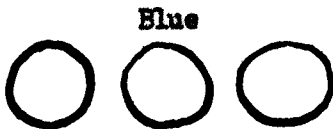
Ans. No.

2.



Ans. No.

3.



Ans. No.

4.



Ans. No.

5.



Ans. No.

6.



Ans. No.

7.

Blue



Ans. No.

8.

Blue



Ans. No.

9.

Blue



Ans. No.

10.



White

Ans. No.

APPROVAL SHEET

The dissertation submitted by Paul J. Wolf, has been read and approved by members of the Department of Psychology.

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the dissertation is now given final approval with reference to content and form.

The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

23 June 69
Date

Patricia M. Barger PhD
Signature of Adviser